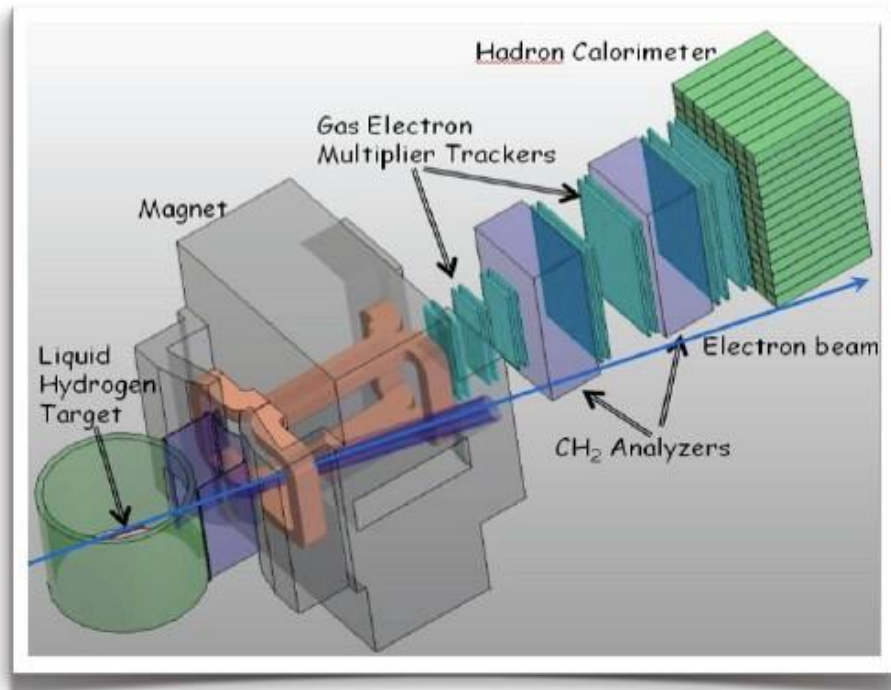


Super-BigBite-Spectrometer (SBS)

Monthly Progress Report

September 15, 2014



Introduction:

The SBS Program consists of three separate, but interrelated Projects.

- The first Project, **SBS Basic (WBS 1)**, involves the acquisition of an existing magnet and the associated work of preparing it for use during the SBS research program. The effort includes modifications to the magnet, including machining a slot in the yoke for beam passage, field clamps, and a solenoid to reduce the transverse magnetic field on the beam line, the design and development of the infrastructure needed to run the magnet, and the construction of the platform on which it will stand.
- The second Project, **Neutron Form Factor (WBS 2)**, involves the construction of The PMT-based Coordinate Detector (CDet), trigger electronics for the Hadron Calorimeter (HCal) to meet the requirements of the approved neutron form factor measurements.
- The third and final Project, **Proton Form Factor (WBS 3)**, involves the construction of forty GEM detector modules with associated front-end and DAQ modules to meet the requirements of the approved proton form factor measurement.

Project Management Highlights:

This is the 24th Monthly Progress Report for the SBS Program.

The SBS Basic (WBS 1) project started in FY13. The SBS Neutron Form Factor (WBS 2) started at the beginning of FY14. The SBS Proton Form Factor (WBS 3) started on October 1, 2012.

- Agenda for the DOE November 4 and 5th 2014 review has been finalized.
- The SBS magnet has been assembled in the TestLab which completes a Level 3 milestone. Final stages of preparation for low current test in September are underway.

WBS 1: SBS Basic

WBS 1	SBS Basic: (Hall A Infrastructure)	WBS 1.01	Milestones
		WBS 1.02	Project Oversight
		WBS 1.1	Magnet, power and construction
		WBS 1.2	Magnet/detector platforms
		WBS 1.3	Beam line

WBS 1.02 Project Oversight:

- SBS weekly meetings, via tele and video conference were held on August 6,13,20 and 27th. Participants included Jefferson Lab, University of Virginia, Carnegie-Mellon University, William and Mary, Norfolk State University, University of Connecticut, University of Glasgow, Saint Mary's University, Idaho State University, and INFN Rome.
- Project is staffed appropriately for this stage, and includes a Jefferson Lab manager, scientist, and magnet engineer.

WBS 1.1 Magnet, Power and Construction:

- Assembly of the magnet with two racetrack coils and the existing saddle coil was completed on Sept 4th. This completes a level 3 milestone. Photo of the assembly is shown in Figure 1.
- In Testlab, ongoing work to connect water and power. Plan to test the magnet at low power by end of September.
- The power supply will be shipped first week of September. Expect arrival at Jlab the first week of October.
- Beam line correction magnets have been costed.
- Preliminary drawing of magnet clamp was completed. The clamp can be built using iron obtained from BNL when the magnet was shipped. The only cost for the clamp will be for assembling and machining which is well below the cost in the ETC.
- Coils:
 - Racetrack coils: Six coils are on site. Five coils remain to be delivered.
 - Saddle coil: When the finalized cost for front clamp and beam line correction magnet are combined with the procurement of the scattering chamber snout (see WBS 1.3) in September, this puts us in excellent shape with regards to contingency for procuring the saddle coil.



Figure 1 The SBS magnet assembled in the Testlab. The magnet will be tested with the original saddle coil and two of the racetrack coils. The beam cut out is on the right side. The cooling water and power are currently being connected for the low current (200A) test.

WBS 1.2 Magnet/Detector Platforms:

- Platform counterweight assembly had been ordered.
- The main platform delivery is expected in November 2014. This is 4 months past the scheduled date, but item has large float.

WBS 1.3 Beam Line:

- The exit beam pipe detailing is ongoing and is expected to be completed by Oct 30th.
- Detailing the scattering chamber snout should be completed by Sept 12th and then sent to procurement.

WBS 1 Costs:

- The budget for this WBS for FY14 is \$643K. The incremental budget (FY13+FY14) is \$1,481K
- Costed and obligated as of 9/1/2014: \$896K (60%).

WBS 1.01 Milestones: (see [Appendix 1](#) for graphic view of milestones)

Level (ID#)	Milestone	Scheduled Date	Expected Date 8/1/2014	Expected Date 9/1/2014	Comment
1 (1.1-01M)	Project start	10/1/2012			Completed 10/1/2012
2 (2-01M)	Magnet delivered to JLab	4/30/2013			Completed 8/21/2013
3	Power supply received	1/4/2014	9/15/2014	10/3/2014	Will be shipped by 1 st week of Sept.
3	Magnet yoke modifications Completed	4/1/2014			Completed 5/22/2014
2 (1.2-10M)	Platform parts received	6/27/2014	11/1/2014	11/1/2014	Bid awarded. Expect delivery 11/1/2014. Platform is not needed for test in the Testlab.
3	Assemble magnet in Testlab	7/1/2014	8/1/2014		Completed 9/4/2014
3	Commissioning test of magnet in Testlab completed	10/1/2014	10/1/2014	10/1/2014	
3	Beampipe solenoid correctors received	1/5/2015	1/5/2015	1/5/2015	
3	Detector supports completed	4/1/2015	4/1/2015	4/1/2015	
2 (1.2-30M)	Beam-line parts received	9/24/2015	9/24/2015	9/24/2015	
1 (1.1-10M)	Project completion	1/29/2016	1/29/2016	1/29/2016	

WBS 2: Neutron Form Factor

WBS 2	Neutron Form Factor	WBS 2.01	Milestones
		WBS 2.02	Project oversight
		WBS 2.1	Coordinate Detector (ISU)
		WBS 2.2	Electronics Hut, Lead Shielding, Lead platform, and Detector Frames (JLab)
		WBS 2.3	Pole Shims and field clamp (JLab)
		WBS 2.4	Trigger (RU)

WBS 2.02 Project Oversight:

- SBS weekly meetings, via tele and video conference were held on August 6,13,20 and 27th. Participants included Jefferson Lab, University of Virginia, Carnegie-Mellon University, William and Mary, Norfolk State University, University of Connecticut, University of Glasgow, Saint Mary's University, Idaho State University, and INFN Rome.
- Project is staffed appropriately for this stage, and includes Jefferson Lab (manager, scientist) and Idaho State University (one scientist).

WBS 2.1 Coordinate Detector (ISU):

- Testing of prototype mechanical module was completed. This meets the level 3 milestone.
- Contract with ISU for construction of the coordinate detector is in procurement.
- Scintillator order is still in procurement. The two month delay in procuring reduces the float to eight months.

WBS 2.2 Electronics Hut, Lead Shielding & platform, and Detector Frames:

- Activity will start in FY15 as planned in the PMP.

WBS 2.3 Pole Shims and field clamp:

- Preliminary design of field clamp is complete.

WBS 2.4 Trigger:

- Order for the Flash ADCs needed for the trigger has been completed. Purchasing of rest of trigger will be in FY15 as planned in the PMP.

WBS 2 Costs:

- Budget for this WBS for FY14 is \$599K. The incremental budget (FY14+FY15) is \$834K which only includes the FADC for the trigger and the CDET frame which move forward from FY15.
- Costed and obligated as of 9/1/2014: \$662K (79%).

WBS 2.01 Milestones: See [Appendix 1](#) for a graphic view of the milestones .

Level	Milestone	Scheduled Date	Expected date 8/1/2014	Expected date 9/1/2014	Comment
1	Project start	10/1/2013			Completed 10/1/2013
3	Scintillator and Wavelength Shifting Fibers ordered	7/30/2014	8/30/2014	9/30/2014	Delayed by two months Requisition made on July 29 th .
3	Finish testing of module prototype	8/30/2014	8/30/2014		Completed 8/30/2014
3	Scintillator shipped for machining	10/30/2014	10/30/2014	12/30/2014	
3	Complete plastic absorber structure design	11/15/2014	11/15/2014	11/15/2014	
3	Begin assembly of modules	12/15/2014	12/15/2014	2/15/2015	
3	Begin construction of plastic absorber structure	1/15/2015	1/15/2015	1/15/2015	
2	Coordinate Detector assembled	3/30/2015	3/30/2015	5/30/2015	
2	JLab receives exit field clamp	6/2/2015	6/2/2015	6/2/2015	
2	Electronics Hut Assembled	10/2/2015	10/2/2015	10/2/2015	
2	Trigger completed	10/4/2015	10/4/2015	10/4/2015	
1	Project completion	1/29/2016	1/29/2016	1/29/2016	

WBS 3: Proton Form Factor

WBS 3	Proton Form Factor	WBS 3.01	Milestones
		WBS 3.02	Project Oversight
		WBS 3.1	GEMs (UVa)
		WBS 3.2	GEM electronics (UVa)

WBS 3.02 Project Oversight:

- SBS weekly meetings, via tele and video conference were held on August 6,13,20 and 27th. Participants included Jefferson Lab, University of Virginia, Carnegie-Mellon University, William and Mary, Norfolk State University, University of Connecticut, University of Glasgow, Saint Mary's University, Idaho State University, and INFN Rome.
- Project is staffed appropriately for this beginning stage, and includes Jefferson Lab (manager, scientist) and UVa (two scientists).

WBS 3.1 GEMs

- The production of GEM module 3 is currently underway. This module is expected to be completed by September 10th. Delivery of GEM readout planes for construction of remaining modules is delayed until Sept 15th for reasons described in previous month's report. This delay leaves 9 ½ months float in the schedule.
- The frames for 26 GEM modules, 162 frames in total, arrived from Resarm Inc. in Belgium. The frames for the first 3 modules arrived previously. The inspection of the frames in the new shipment indicated that 7 frames had defects making them unacceptable. These frames were sent back to Resarm and they have agreed to replace all 7 frames.
- UVa received quotations for the fabrication of the two extra frames needed to fix the previously reported readout support deformation issue. This is a 2% increase in the cost of the GEM modules.

WBS 3.2 GEM electronics

- Reports from the reviewers were received by Sept 5th. Their reports are being reviewed and a final decision on the GEM electronics will be made by the end of September.

WBS 3 Costs:

- Budget for this WBS for FY14 is \$665K. The incremental budget (FY14+FY15) is \$1134K which includes moving the production of an additional 11 GEMs forward from FY15.
- Costed and obligated as of 8/1/2014: \$976K (86%)

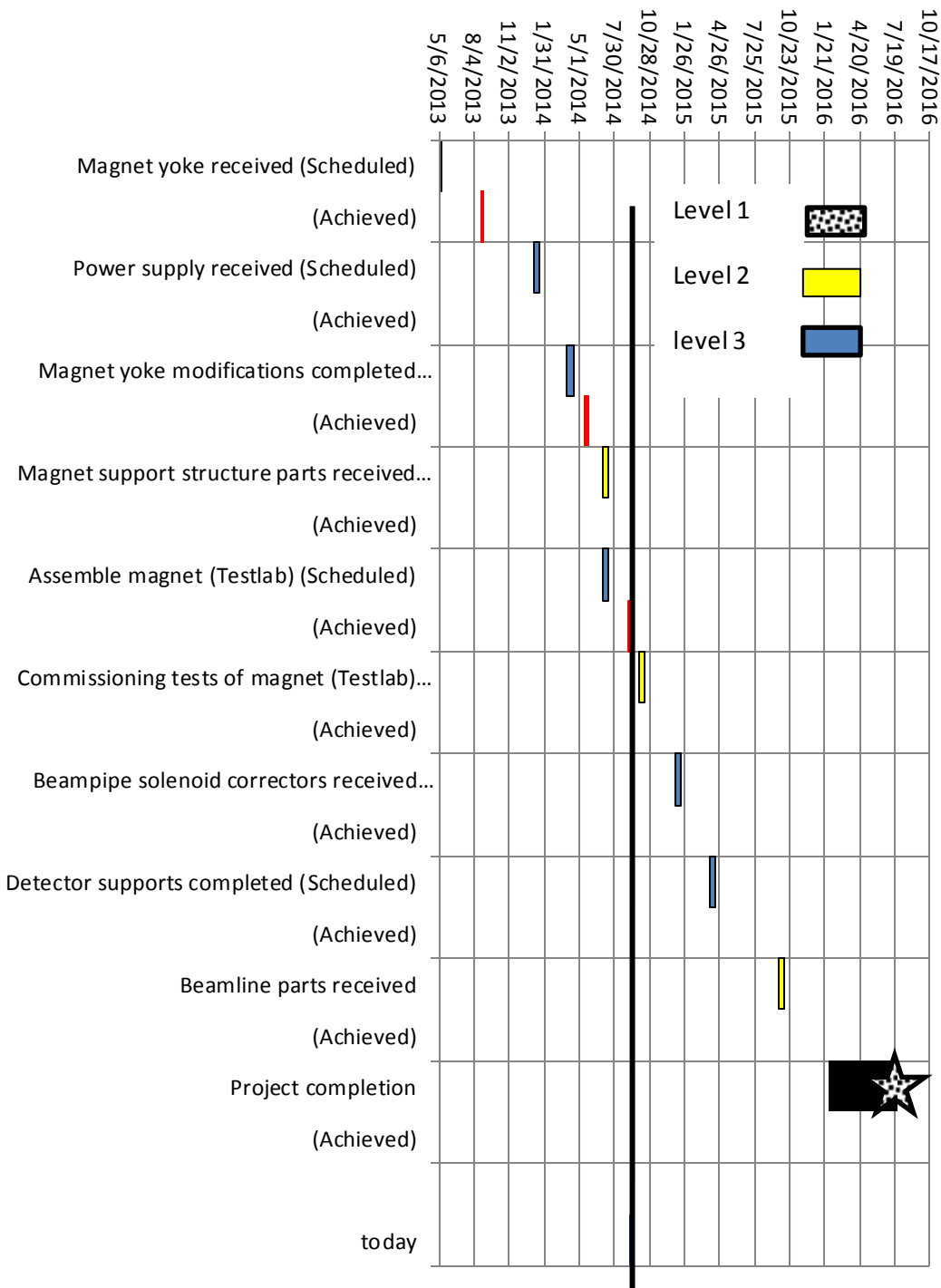
- **WBS 3.01 Milestones:** (see [Appendix 1](#) for a graphic view of the milestones)

Level (ID#)	Milestone	Scheduled Date	Expected date 8/1/2014	Expected date 9/1/2014	Comment
1 (3.1-01M)	Project start	10/1/2012			Completed 10/1/2012
3	Order GEM Parts	10/1/2013			Completed 10/18/2013
3	UVa receives GEM parts	2/3/2014			Completed 4/23/2014
2 (3.2-01M)	First module assembled and tested	3/3/2014			Completed 5/15/2014
2 (3.2-10M)	UVa 5 GEM modules assembled and tested	6/2/2014	10/1/2014	11/1/2014	Expect to finish 3 rd GEM module by Sept 10 th . Delivery of GEM readout planes for construction of remaining modules is delayed until Sept 15 th
2 (3.2-10M)	UVa 6-16 GEM modules assembled and tested	9/30/2014	3/1/2015	4/15/2015	
2 (3.2-30M)	UVa 17-29 GEM modules assembled and tested	3/2/2015	9/1/2015	11/1/2015	
2 (3.2-40M)	UVa 30-40 GEM modules assembled and tested	7/15/2015	3/1/2016	4/15/2016	
2 (3.2-50M)	1 st order of Front End Electronics	10/1/2014	10/1/2014	10/1/2014	
2 (3.2-60M)	2 nd order of Front End Electronics	10/1/2015	10/1/2015	10/1/2015	
1 (3.1-10M)	Project completion	2/1/2017	2/1/2017	2/1/2017	

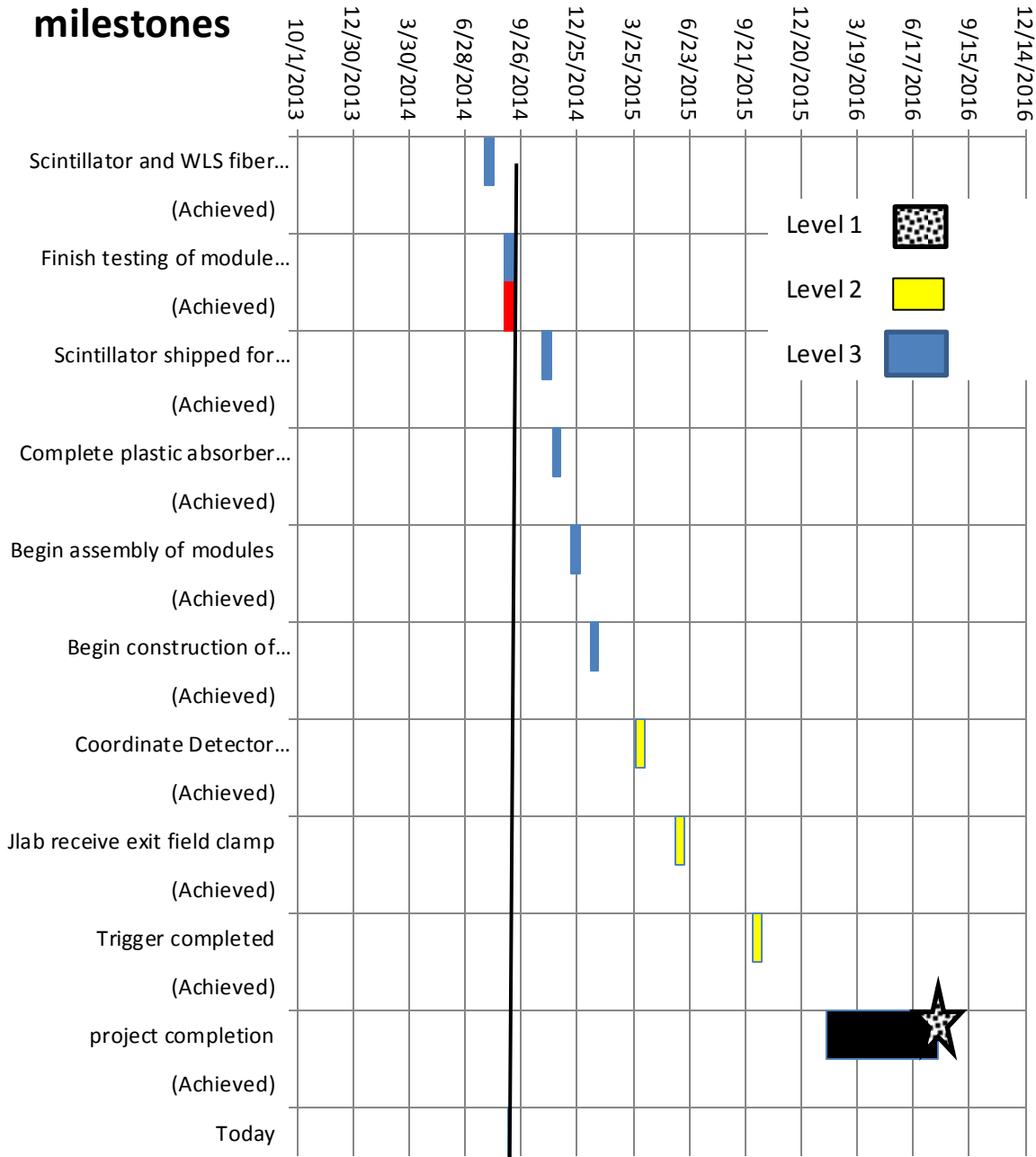
Appendix I

The following are graphical representations of the milestones for SBS Basic (WBS 1), Neutron Form Factor (WBS 2,) and Proton Form Factor (WBS 2), updated on December 1, 2013. Black represents level 1 milestones as specified in the PMP. Yellow represents level 2 milestones from the PMP. Blue represents the new level 3 milestones to allow better quarterly tracking. The black vertical line indicates the day the chart was made. The red bar indicates when the milestone was achieved (e.g. Magnet yoke received).

WBS 1 Milestones



WBS 2 milestones



WBS 3 milestones



Appendix II

List of integration milestones for all equipment off-project, as well as key JLab readiness and safety reviews. For each milestone the additional float is indicated.

Polarized ^3He target from UVA (for GEN)

1. Selection of target-cell design for high luminosity: August 2014 (+3 months float)
2. Simulated-beam test (bench test) of selected design: June 2016 (+6 months float)
3. Design for target hardware and instrumentation complete: January 2017 (+6 month float).
4. GEN Polarized ^3He target is ready, June 2017 (+6 months float)

The Gas Cherenkov detector (GRINCH) from W&M (for GMN and GEN)

1. GRINCH detector design complete and components are ordered: August 2014 (+4 months float).
2. GRINCH detector fully assembled and tested for gas and light tightness: January, 2015 (+ 4 months float).
3. GRINCH is installed and tested in the BB detector frame: September 2015 (+6 months float).
4. GRINCH is ready: September 2016 (+ 4 months float).

Front Tracker from INFN (for GMN, GEN and GEP)

1. Electronics in production: September 2014 **Completed Sept 2014**
2. Four GEM chambers completed and available at JLab (each chamber has 3 GEM modules): Feb 2016 (+3 months float)
3. Rest of GEM chambers (Two) completed and available at JLab (each chamber has 3 GEM modules): Sep 2016 (+3 months float)

HCal-J from CMU

1. Detailed design completed: June 2014 (+2 months float) **Completed July 2014**
2. Design review: September 2014 (+3 months float)
3. Module construction initiated: October 2014 (+4 months float)
4. Module assembly 50% completed: March, 2016 (+4 months float)
5. Construction is completed: September 2016 (+9 months float)

Ecal from JLab

1. Develop concept of annealing: July 2014 (+ 2 months float) . **Completed July 2014**
2. Design review: July 2015 (+4 months float)
3. ECAL electronics is ready: May 2016 (+6 months float)
4. ECAL is ready: Sept. 2017 (+9 months float)